Breakfast habits and differences regarding abdominal obesity in a cross-sectional study in Spanish adults: The ANIBES study
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Introduction

Breakfast is considered the first important meal of the day. Regarding obesity, previous research has shown that children and adolescents who eat breakfast regularly have a lower Body Mass Index (BMI) and better long-term weight management than breakfast skippers. In adults, it has also been observed that eating breakfast regularly decreased the prevalence of overweight and obesity.

The aim of this study was to describe the breakfast habits of the Spanish adult population and to assess the possible association between breakfast frequency and the presence of abdominal obesity.
Materials and Methods

The design, protocol and methodology have been already described in detail in previous scientific works belonging to the ANIBES Study; as well as the total distribution of macronutrients and dietary sources in the Spanish population which are included in this study.

This new research work, focused in the analysis of breakfast habits, has a representative sample of 1,655 Spanish adults (18 – 64 years old) from the ANIBES scientific study. The study analyses differences between adults with/without abdominal obesity. Abdominal obesity was defined as having a waist-to height ratio ≥ 0.5.

Dietary intake was assessed via face-to-face 24-hour recall and a 3-day food record using a tablet device. The adults were classified into three groups based on the number of days they ate breakfast: never (0/3 days), sometimes (1 – 2/3 days) and always (3/3 days).

The energy provided by breakfast regarding total energy intake was also calculated. An energy intake of 15 – 25 % of total energy was considered adequate. The time spent on breakfast was also analysed, as well as personal, socioeconomic and lifestyle data, together with the food variety included at breakfast.
Breakfast habits

The majority of Spanish adults regularly ate breakfast. Omitting breakfast was associated with other unhealthy habits, such as smoking and being less active. Regular breakfast consumption was negatively associated with abdominal obesity in the Spanish adult population.

Specifically, 3.6 % of the study population skipped breakfast, including significantly more men than women. In this sense, 2 % did not eat anything for breakfast, and 1.6 % had only coffee or tea for breakfast. For its part, 14.1 % did not always have breakfast and 82.3 % of the sample reported consuming breakfast daily.

Skipping breakfast occurred more frequently in young adults (5.8 % in 18 ± 29 years old versus 1.2 % in 60 ± 64 years old), in males (4.8 % versus 2.5 % in females), in rural populations (5.2 % versus 1.6 % in semiurban and 4.0 % in urban), in immigrant populations (7.6 % versus 3.4 %), in smokers (5.3 % versus 2.7 %) and in those less physically active (6.9 % versus 2.7 %).

Breakfast represented 16.7 % of total daily energy intake, and intake from breakfast was inadequate in 59.2 % of the adults, being more frequently insufficient (< 15 %) than excessive (> 25 %).
## Breakfast habits regarding sex and WHtR categories

<table>
<thead>
<tr>
<th></th>
<th>WHtR &lt; 0.5</th>
<th></th>
<th></th>
<th>WHtR ≥ 0.5</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Men</td>
<td>Women</td>
<td>Total</td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Age (y) (m ± sd)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 – 40 (%)</td>
<td>34.0 ± 11.0***</td>
<td>32.5 ± 11.2***</td>
<td>35.0 ± 10.7***</td>
<td>44.2 ± 11.2***</td>
<td>43.5 ± 10.9***</td>
<td>45.0 ± 11.5***</td>
</tr>
<tr>
<td>41 – 64 (%)</td>
<td>73.4*</td>
<td>78.4*</td>
<td>70*</td>
<td>39*</td>
<td>41.5*</td>
<td>36.2*</td>
</tr>
<tr>
<td>Breakfast (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>2.9</td>
<td>3.6</td>
<td>2.5</td>
<td>4.1</td>
<td>5.5</td>
<td>2.4</td>
</tr>
<tr>
<td>Sometimes</td>
<td>16.4*</td>
<td>20.9*</td>
<td>13.3</td>
<td>12.5*</td>
<td>14.7*</td>
<td>10</td>
</tr>
<tr>
<td>Always</td>
<td>80.7</td>
<td>75.5</td>
<td>84.3</td>
<td>83.4</td>
<td>79.8</td>
<td>87.5</td>
</tr>
<tr>
<td>Total energy intake (kcal/day) (m ± sd)</td>
<td>1,886 ± 543***</td>
<td>2,102 ± 581***</td>
<td>1,736 ± 460***</td>
<td>1,765 ± 482***</td>
<td>1,892 ± 507***</td>
<td>1,620 ± 407***</td>
</tr>
<tr>
<td>Breakfast energy intake (kcal/day) (m ± sd)</td>
<td>310.8 ± 169.3</td>
<td>339.3 ± 189.0**</td>
<td>291.2 ± 151.6</td>
<td>294.9 ± 169.3</td>
<td>299.4 ± 170.8**</td>
<td>289.9 ± 148.1</td>
</tr>
<tr>
<td>Breakfast energy intake (% total energy intake) (m ± sd)</td>
<td>1.3 ± 0.7</td>
<td>1.4 ± 0.8**</td>
<td>1.2 ± 0.6</td>
<td>1.2 ± 0.7</td>
<td>1.3 ± 0.7**</td>
<td>1.2 ± 0.6</td>
</tr>
<tr>
<td>Individuals whose breakfast provides: (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 – 25 % energy total</td>
<td>39.3</td>
<td>36.3</td>
<td>41.4</td>
<td>41.9</td>
<td>40.5</td>
<td>43.4</td>
</tr>
<tr>
<td>&lt; 15 % energy total</td>
<td>45.7</td>
<td>49.5</td>
<td>43.1</td>
<td>42.8</td>
<td>47.1</td>
<td>38.1</td>
</tr>
<tr>
<td>&gt; 25 % energy total</td>
<td>15</td>
<td>14.3</td>
<td>15.5</td>
<td>15.3</td>
<td>12.4</td>
<td>18.5</td>
</tr>
<tr>
<td>Food variety at breakfast (number of foods at breakfast/day) (m ± sd)</td>
<td>2.25 ± 1.00*</td>
<td>2.33 ± 1.12*</td>
<td>2.20 ± 0.91</td>
<td>2.16 ± 0.89*</td>
<td>2.13 ± 0.93*</td>
<td>2.18 ± 0.84</td>
</tr>
<tr>
<td>Time used for breakfast (minutes/day) (m ± sd)</td>
<td>12.12 ± 8.72</td>
<td>11.72 ± 9.75</td>
<td>12.40 ± 7.95</td>
<td>12.73 ± 8.96</td>
<td>12.07 ± 9.19</td>
<td>13.47 ± 8.63</td>
</tr>
</tbody>
</table>

m: mean; sd: standard deviation; WHtR: Waist to height ratio; Student's t test for normally distributed variables and Mann Whitney test for variables with non-normal distribution. Z test proportions for variables expressed in proportions. Significant differences between adults with WHtR < 0.5 and WHtR ≥ 0.5.

* p < 0.05.
** p < 0.01.
*** p < 0.001.
More frequently consumed breakfasts

The most frequently consumed food groups at breakfast were milk and dairy products with cereals and grains (34.6 %); milk and dairy products with cereals and grains and fruits (16.8 %) and milk and dairy products with cereals and grains, fruits and protein-rich foods (10.4 %), whereas 10 % of adults only had some milk and dairy products for breakfast.

More frequently consumed breakfasts regarding WHtR categories (% consumers)

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>WHtR &lt; 0.5</th>
<th>WHtR ≥ 0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only cereals</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Only coffee or tea</td>
<td>1.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Only fruit</td>
<td>1.3</td>
<td>0.9</td>
</tr>
<tr>
<td>Only dairy products</td>
<td>9.1</td>
<td>8.9</td>
</tr>
<tr>
<td>Protein-rich foods + Cereals + Dairy products</td>
<td>7.6</td>
<td>8.2</td>
</tr>
<tr>
<td>Other breakfasts</td>
<td>4.9</td>
<td>5.9</td>
</tr>
<tr>
<td>Dairy products + Cereals + Fruit</td>
<td>11.2</td>
<td>15.9</td>
</tr>
<tr>
<td>Dairy products + Cereals</td>
<td>10.3</td>
<td>10.4</td>
</tr>
<tr>
<td>Dairy products with cereals and grains</td>
<td>18.0</td>
<td>35.6</td>
</tr>
<tr>
<td>Cereals + Fruit</td>
<td>1.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Only dairy products</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>Other foods usually not consumed at breakfast</td>
<td>5.9</td>
<td>4.9</td>
</tr>
</tbody>
</table>

WHtR: Waist to height ratio.

Other breakfasts include combinations different to the described ones, such as protein-rich foods with cereals, or with dairy products, or with fruit.
More frequently consumed breakfasts regarding sex and WHtR categories (% consumers)

Men with WHtR < 0.5

- Only dairy products: 11.0%
- Only coffee or tea: 0.4%
- Cereals + Fruit: 11.4%
- Other breakfasts: 11.4%
- Cereals + Fruit + Protein-rich foods: 12.1%
- Dairy products + Cereals + Fruit: 13.2%
- Dairy products + Cereals: 34.1%

Men with WHtR ≥ 0.5

- Only coffee or tea: 1.6%
- Other foods usually not consumed at breakfast: 2.6%
- Cereals + Fruit: 11.2%
- Only dairy products: 10.4%
- Only coffee or tea: 10.4%
- Cereals + Fruit + Protein-rich foods: 12.0%
- Cereals + Cereals + Fruit: 35.3%

Women with WHtR < 0.5

- Only fruit: 0.9%
- Only coffe or tea: 2.2%
- Other foods usually not consumed at breakfast: 4.2%
- Cereals + Fruit: 10.2%
- Only dairy products: 8.0%
- Other breakfasts: 12.5%
- Cereals + Cereals + Fruit: 35.9%

Women with WHtR ≥ 0.5

- Only fruit: 1.0%
- Only coffe or tea: 0.5%
- Other foods usually not consumed at breakfast: 5.0%
- Cereals + Fruit: 11.3%
- Only dairy products: 11.3%
- Other breakfasts: 21.3%
- Cereals + Cereals + Fruit: 32.8%

WHtR: Waist to height ratio
Intake of food groups and subgroups at breakfast

In food variety at breakfast, there have been taken into account foods that belong to one of this food groups: cereals and grains, milk and dairy products, fruits and protein-rich foods.

Foods consumed at breakfast regarding sex and WHtR categories (% consumers)

<table>
<thead>
<tr>
<th></th>
<th>WHtR &lt; 0.5</th>
<th></th>
<th></th>
<th>WHtR ≥ 0.5</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Men</td>
<td>Women</td>
<td>Total</td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Dairy products</td>
<td>89.9</td>
<td>88.6</td>
<td>90.7</td>
<td>88.2</td>
<td>85.6</td>
<td>91.1</td>
</tr>
<tr>
<td>Cereals</td>
<td>84.1</td>
<td>83.2</td>
<td>84.7</td>
<td>84.2</td>
<td>80.8</td>
<td>88.0</td>
</tr>
<tr>
<td>Fruit + Juice</td>
<td>41.8*</td>
<td>42.9*</td>
<td>41.1</td>
<td>36.7*</td>
<td>34.7*</td>
<td>39.0</td>
</tr>
<tr>
<td>Protein-rich foods</td>
<td>26.2</td>
<td>30.0</td>
<td>23.6</td>
<td>26.4</td>
<td>28.1</td>
<td>24.5</td>
</tr>
<tr>
<td>Other foods</td>
<td>5.7</td>
<td>7.4</td>
<td>4.4</td>
<td>5.9</td>
<td>5.2</td>
<td>6.7</td>
</tr>
<tr>
<td>Beverages</td>
<td>9.4</td>
<td>6.0</td>
<td>11.8</td>
<td>7.6</td>
<td>6.0</td>
<td>9.3</td>
</tr>
<tr>
<td>Fats</td>
<td>40.9</td>
<td>37.2</td>
<td>43.5</td>
<td>45.0</td>
<td>39.5</td>
<td>51.3</td>
</tr>
<tr>
<td>Other products</td>
<td>86.8</td>
<td>84.0</td>
<td>88.7</td>
<td>89.9</td>
<td>86.2</td>
<td>94.0</td>
</tr>
</tbody>
</table>

WHtR: Waist to height ratio.
Z test proportions. The differences are between the same gender groups.
* p < 0.05.
The most consumed food groups were milk and dairy products (88.9 %), especially semiskimmed milk (43.8 %) and less frequently whole milk (28.2 %) and skimmed milk (22.3 %). In this regard, there were more men who consumed whole milk at breakfast than women, whereas there were more women who chose skimmed milk and soya drinks more often than men.

In the study population, cereals and grains were the second most chose food group at breakfast (84.2 %), in particular bread (51.6 %), and in lower proportions, cookies (25.7 %), bakery and pastry (20.6 %), and breakfast cereals and cereal bars (12.9 %). Furthermore, 26.3 % included protein-rich foods, especially sausages and other meat products (20 %) and eggs (7.2 %). 19.3 % of the population included juices and nectars and 17.5 % fruits.

Regarding to fats, 29.2 % included oils, mainly olive oil (25.3 %), while 22.9 % used other fats (butter, margarine, etc.). Butter, margarine and shortening were also significantly more consumed by women than men, similar to jam consumption.

Sugar was the most widely used sweetener (46.9 %), with no gender differences, although saccharin was more frequently used in women than men. The variety at breakfast was significantly higher in men than in women; however, women spent more time on breakfast than men.
Breakfast and abdominal obesity

The results of the present work from the ANIBES scientific study showed that men who usually skipped breakfast had a higher waist circumference and higher WHtR than men who usually had breakfast.

The odds of abdominal obesity decreased in those who ate breakfast sometimes and always. Specifically, the odds of abdominal obesity were 1.5 times higher for those who skipped breakfast when compared to those who always have breakfast.

There have been also found significant differences in breakfast composition regarding abdominal obesity. Men with abdominal obesity had less food variety at breakfast and lower consumption of fruit in their first meal of the day comparing with those with no abdominal obesity.

Comparing with adults without abdominal obesity, there were more consumers of coffee, tea, saccharin (men and women) and skimmed milk (women) with abdominal obesity, while there were less consumers of cocoa, chocolate and juices and nectars (men and women), bakery and pastry, breakfast cereals and cereal bars, fruits and eggs (men).

There were not observed differences in the type of breakfast regarding WHtR categories but, for both total sample and males, the variety of foods at breakfast was lower among those with abdominal obesity.

These results reinforce the importance of nutritional education in the Spanish adult population to promote the importance of an adequate breakfast in preventing abdominal obesity.
Breakfast and lifestyle

Regarding this study, factors contributing to skipping breakfast include a lack of knowledge about the relationship between nutrition and health and lack of time to make or prepare breakfast and concern about body weight.

In relation to physical activity, 16.9 % did regular exercises in the group who did not have breakfast versus 33.9 % and 33.1 % in the groups who ate breakfast sometimes and always, respectively.

On the other hand, there was a significant interaction between breakfast frequency and smoking. Smokers who eat breakfast sometimes or always, had a lower odd of abdominal obesity than smokers who skipped breakfast. Specifically, the percentage of breakfast consumers in the study who reported smoking (43.3 % and 32.6 % in adults who ate breakfast “sometimes” and “always”, respectively) was lower than the proportion of smokers in the breakfast nonconsumers group (50.8 %).
References


Scientific Committee

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The final protocol of the ANIBES scientific study was previously approved by the Clinical Research Ethics Committee of the Autonomous Region of Madrid (Spain).